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(54) **SYSTEMS AND METHODS FOR DETECTING AN UNATTENDED CHILD IN A CHILD SAFETY SEAT OF A VEHICLE**

(71) Applicant: **Verizon Patent and Licensing Inc.**, Arlington, VA (US)

(72) Inventors: **Ketan Shridhar Adkar**, Alpharetta, GA (US); **Charles Forbes Stickels**, Milton, GA (US); **John Gregory Bosque**, Roswell, GA (US); **Diego Mondragon**, Roswell, GA (US); **Joseph Richard Cantrell**, Atlanta, GA (US)

(73) Assignee: **Verizon Patent and Licensing Inc.**, Basking Ridge, NJ (US)

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Primary Examiner — Kerri L Mcnally

(57) **ABSTRACT**

A detection system may include a first sleeve shaped to receive and retain a buckle of a child safety seat. The first sleeve may include a first body portion shaped to receive and retain the buckle, a male connector portion integrally formed with the first body portion, and a transmitter electrically coupled to the male connector portion. The detection system may include a second sleeve shaped to receive and retain a buckle connector. The second sleeve may include a second body portion shaped to receive and retain the buckle connector, a female connector portion connected to the second body portion, and a battery electrically coupled to the female connector portion and configured to provide energy to the transmitter when the male connector portion communicates with the female connector portion. The transmitter may generate a signal, indicating a presence of a child, when the transmitter receives energy from the battery.

20 Claims, 12 Drawing Sheets

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100
Vehicle
110
Detection
system
115
Child safety seat
Generate a signal indicating that a child is secured and
present in the child safety seat
User
device
105
Caregiver
Warning baby in car
0:00 seconds
Confirm

FIG. 1A

100
Child safety seat
Child safety seat belt buckle
Child safety seat belt buckle
Connect
Connect
Child safety seat belt buckle connector

FIG. 1B

100
Child safety seat
belt buckle
Insert
Child safety seat
Front
Back
Child safety seat
belt buckle sleeve
120
Child safety seat
belt buckle sleeve
120
Male connector
125

FIG. 1C

100
Child safety seat
Front
Back
Child safety seat belt buckle connector sleeve 130
Child safety seat belt buckle connector sleeve 130
Female connector 135

FIG. 1D

Male connector
125
Transmitter
140
Connect
Female connector
135
Battery
145
Male connector
125
Connected
150
Transmitter
140
Female connector
135
Battery
145
155
Generate a signal indicating that child safety seat is secured
100

FIG. 1E

Female connector
135
Child safety seat belt
buckle connector sleeve
130
Male connector
125
Child safety seat belt
buckle sleeve
120

FIG. 1F

100

100
Child safety seat belt buckle sleeve 120
Sleeve body 160
Male connector 125
Child safety seat belt buckle connector sleeve 130
Female connector 135
Sleeve body 165

FIG. 1G

100
Determine whether the vehicle is moving or is parked
Determine whether the signal is received
Generate an alert when the vehicle is parked and when the signal is not received
Caregiver
User device 105
170
Generate a signal indicating that a child is secured and present in the child safety seat
Detection system 115
Child safety seat
Vehicle 110

FIG. 1H

100
Vehicle
110
Detection
system
115
Child safety seat
175
Generate a signal indicating that the battery is running
low
User
device
105
Caregiver
Battery is running
low
Please replace the
battery

FIG. 1I

FIG. 2

300
Processor
320
Memory
330
Storage component
340
Bus
310
Input component
350
Output component
360
Communication interface
370

FIG. 3

400
410
Interconnect a buckle and a buckle connector of a child safety seat
420
Interconnect a male connector, attached to the buckle, and a female connector attached to the buckle connector
430
Electrically couple a battery, connected to the female connector, and a transmitter, connected to the male connector, based on interconnecting the male connector and the female connector
440
Provide energy from the battery to the transmitter based on electrically coupling the battery and the transmitter
450
Generate a signal, indicating that a child is present in the child safety seat, with the transmitter based on providing energy from the battery to the transmitter

FIG. 4

SYSTEMS AND METHODS FOR DETECTING AN UNATTENDED CHILD IN A CHILD SAFETY SEAT OF A VEHICLE

BACKGROUND

A child may be saved when they are properly secured in a child safety seat during a vehicle accident. Leaving a child inside a parked vehicle, even for a second, can be deadly. However, some caregivers do accidentally forget children secured in a child safety seat.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. **1A-1I** are diagrams of one or more example implementations described herein.

FIG. **2** is a diagram of an example environment in which systems and/or methods described herein may be implemented.

FIG. **3** is a diagram of example components of one or more devices of FIG. **2**.

FIG. **4** is a flow chart of an example process for detecting and preventing an unattended child in a child safety seat of a vehicle.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

The following detailed description of example implementations refers to the accompanying drawings. The same reference numbers in different drawings may identify the same or similar elements.

A child may be injured or die if left in a child safety seat of a vehicle after a caretaker has left the vehicle, or if the child is not secured properly in the safety seat. Emergency responders (e.g., police, emergency medical technicians, fire departments, and/or the like) may be called to care for injured children left in child safety seats of vehicles. Thus, computing resources (e.g., processing resources, memory resources, communication resources, and/or the like), networking resources, emergency response resources, hospital resources, and/or the like are wasted in responding to injured children left in child safety seats of vehicles, investigating caregivers responsible for the injured children, caring for the injured children, and/or the like.

Some implementations described herein provide a detection system that detects and prevents leaving a child unattended in a child safety seat of a vehicle. For example, the detection system may include a first sleeve, shaped to receive and retain a buckle of a child safety seat. The first sleeve may include a first body portion shaped to receive and retain the buckle of the child safety seat, a male connector portion integrally formed with the first body portion, and a transmitter electrically coupled to the male connector portion. The detection system may include a second sleeve, shaped to receive and retain a buckle connector of the child safety seat. The buckle connector of the child safety seat may be configured to receive and connect with the buckle of the child safety seat. The second sleeve may include a second body portion shaped to receive and retain the buckle connector of the child safety seat, a female connector portion connected to the second body portion, and a battery that is electrically coupled to the female connector portion and configured to provide energy to the transmitter when the male connector portion communicates with the female connector portion. The male connector portion may communicate with the female connector portion when the belt buckle connector connects with the belt buckle. The transmitter may be configured to generate a signal, indicating that a child is present in the child safety seat, when the transmitter receives energy from the battery.

In this way, the detection system may detect and prevent leaving children unattended in child safety seats of vehicles, which may preclude a need for emergency responders, hospital personnel, and/or the like. Thus, the detection system conserves computing resources (e.g., processing resources, memory resources, communication resources, and/or the like), networking resources, emergency response resources, hospital resources, and/or the like that would otherwise be wasted in responding to injured children left in child safety seats of vehicles, investigating caregivers responsible for the injured children, caring for the injured children, and/or the like.

FIGS. **1A-1I** are diagrams of one or more example implementations **100** described herein. Many jurisdictions require children defined by age, weight, and/or height to use an approved child safety seat when traveling in a vehicle. As shown in FIG. **1**A, a user device **105** may be associated with a vehicle **110** and a detection system **115** provided with a child safety seat. The child safety seat may include a seat specifically designed to protect children from injury or death during vehicle collisions. The child safety seat may be removable from the vehicle or may be integrated into the vehicle. Detection system **115** may include a system that detects and prevents leaving a child unattended in the child safety seat of the vehicle.

As further shown in FIG. **1**A, detection system **115** may generate a signal indicating that a child is secured and present in the child safety seat (e.g., when the child is buckled in the child safety seat). In some implementations, the signal may be received by user device **105** within a particular distance that is based on a strength of the signal. For example, the particular distance may be five meters, ten meters, twenty meters, and/or the like. When user device **105** fails to receive the signal, user device **105** may display a user interface to a caregiver (e.g., a parent, a babysitter, a sibling, a grandparent, and/or the like) associated with user device **105**. For example, the user interface may include information indicating that the child was left inside vehicle **110** in the child safety seat, and prompting the caregiver to confirm (e.g., via selection of an input mechanism of the user interface) that the caregiver received the information indicating that the child is inside vehicle **110** in the child safety seat. In this way, the caregiver can immediately return to vehicle **110** and retrieve the child so that the child is not left unattended in vehicle **110**. In some implementations, a software application may be installed on user device **105** which causes user device **105** to receive the signal from detection system **115**, display the user interface, enable the caregiver to set preferences associated with operation of detection system **115**, and/or the like.

As shown in FIG. **1**B, the child safety seat may include at least one child safety seat belt buckle (also referred to as a belt buckle or a buckle) and at least one child safety seat belt buckle connector (also referred to as a belt buckle connector or a buckle connector) that is configured to receive and connect with the belt buckle. The belt buckle may be connected with the belt buckle connector by inserting the belt buckle into the belt buckle connector. The belt buckle may include a mechanism (e.g., a button that can be depressed) for disconnecting the belt buckle from the belt buckle connector. Alternatively, or additionally, the belt buckle connector may include a mechanism (e.g., a button that can be depressed) for disconnecting the belt buckle from

the belt buckle connector. The belt buckle may be disconnected from the belt buckle connector to allow a child to be placed into the child safety seat, and may be connected to the belt buckle connector to secure the child in the child safety seat.

As shown in FIG. **1**C, a child safety seat belt buckle sleeve **120** (also referred to as belt buckle sleeve **120**) may be attached to the belt buckle by sliding belt buckle sleeve **120** over an outer surface of the belt buckle. In some implementations, if the child safety seat utilizes multiple belt buckles, as shown in FIG. **1**B, belt buckle sleeve **120** may be attached to each of the multiple belt buckles. In some implementations, belt buckle sleeve **120** may receive and retain the belt buckle, as shown. For example, belt buckle sleeve **120** may include openings on opposite ends and may slide over the outer surface of the belt buckle. This may enable the belt buckle to extend through belt buckle sleeve **120**, so that the belt buckle may connect to the belt buckle connector, as described above. In some implementations, belt buckle sleeve **120** may include a size and a shape that substantially matches a size and a shape of the belt buckle so that an inner surface of belt buckle sleeve **120** frictionally engages the outer surface of the belt buckle. Thus, belt buckle sleeve **120** may include multiple variations of shapes and sizes, corresponding to different shapes and sizes of belt buckles. In some implementations, belt buckle sleeve **120** may include an elastomeric material (e.g., a natural rubber, a synthetic rubber, a thermoplastic material, a saturated rubber, an unsaturated rubber, and/or the like).

Additionally, belt buckle sleeve **120** may include an opening (e.g., on a front side of belt buckle sleeve **120**) to allow access to the mechanism (e.g., the button that can be depressed) for disconnecting the belt buckle (e.g., when the mechanism for disconnecting the belt buckle is on a front side of the belt buckle). Alternatively, when the mechanism for disconnecting the belt buckle is on a back side of the belt buckle, belt buckle sleeve **120** may include an opening (e.g., on a back side of belt buckle sleeve **120**) to allow access to the mechanism for disconnecting the belt buckle.

As further shown in FIG. **1**C, belt buckle sleeve **120** may include a male connector **125**. As shown, male connector **125** may be provided on a back side of belt buckle sleeve **120**. Alternatively, when the mechanism for disconnecting the belt buckle is on the back side of the belt buckle, male connector **125** may be provided on a front side of belt buckle sleeve **120**. In some implementations, male connector **125** may include one or more pins that are sized and shaped to be received by one or more corresponding openings provided in a female connector, as described below. In some implementations, male connector **125** may include a male universal serial bus (USB) connector.

In some implementations, belt buckle sleeve **120** may include one or more sensors, such as a temperature sensor (e.g., a thermometer for measuring a temperature inside the vehicle), a heartrate sensor (e.g., for measuring a heartrate of a child in the child safety seat), a microphone (e.g., for capturing sounds from the child in the child safety seat), an accelerometer, a global positioning system (GPS) sensor, and/or the like.

As shown in FIG. **1**D, a child safety seat belt buckle connector sleeve **130** (also referred to as belt buckle connector sleeve **130**) may be attached to the belt buckle connector by sliding belt buckle connector sleeve **130** over an outer surface of the belt buckle connector. In some implementations, belt buckle connector sleeve **130** may receive and retain the belt buckle connector, as shown. For example, belt buckle connector sleeve **130** may include openings on opposite ends, and may slide over the outer surface of the belt buckle connector. This may allow the belt buckle connector to receive and connect with the belt buckle, as described above. In some implementations, belt buckle connector sleeve **130** may include a size and a shape that substantially matches a size and a shape of the belt buckle connector so that an inner surface of belt buckle connector sleeve **130** frictionally engages the outer surface of the belt buckle connector. Thus, belt buckle connector sleeve **130** may include multiple variations of shapes and sizes, corresponding to different shapes and sizes of belt buckle connectors. In some implementations, belt buckle connector sleeve **130** may include an elastomeric material, such as the elastomeric material described above in connection with belt buckle sleeve **120**.

Additionally, belt buckle connector sleeve **130** may include an opening (e.g., on a front side of belt buckle connector sleeve **130**) to allow access to a mechanism (e.g., a button that can be depressed) for disconnecting the belt buckle (e.g., when the mechanism for disconnecting the belt buckle is on the front side of the belt buckle connector). Alternatively, when the mechanism for disconnecting the belt buckle is on the back side of the belt buckle connector, belt buckle connector sleeve **130** may include an opening (e.g., on a back side of belt buckle connector sleeve **130**) to allow access to the mechanism for disconnecting the belt buckle.

In some implementations, belt buckle connector sleeve **130** may include a female connector **135**. As shown, female connector **135** may be provided on a back side of belt buckle connector sleeve **130**. Alternatively, when the mechanism for disconnecting the belt buckle is on the back of the belt buckle connector, female connector **135** may be provided on a front side of belt buckle connector sleeve **130**. In some implementations, female connector **135** may include one or more openings that are sized and shaped to receive one or more corresponding pins of male connector **125**. In some implementations, female connector **135** may include a female USB. In some implementations, if the child safety seat includes multiple belt buckles associated with multiple male connectors **125**, belt buckle connector sleeve **130** may include female connector **135** for each of the multiple male connectors **125**.

In some implementations, rather than belt buckle sleeve **120** including male connector **125** and belt buckle connector sleeve **130** including female connector **135**, belt buckle sleeve **120** may include female connector **135** and belt buckle connector sleeve **130** may include male connector **125**. In some implementations, belt buckle connector sleeve **130** may include one or more sensors, such as a temperature sensor, a heartrate sensor, a microphone, an accelerometer, a GPS sensor, and/or the like, as described above with respect to belt buckle sleeve **120**.

As shown in FIG. **1**E, male connector **125** may include a transmitter **140** that is capable of generating a signal (e.g., a wireless signal). In some implementations, transmitter **140** may include a Bluetooth low energy beacon. Female connector **135** may include a battery **145** that is capable of providing energy to transmitter **140**, when battery **145** is connected to transmitter **140**. Alternatively, male connector **125** may include battery **145** and female connector **135** may include transmitter **140**.

Male connector **125** and female connector **135** may be aligned so that male connector **125** may be inserted into female connector **135** when the belt buckle is connected to the belt buckle connector. For example, when male connector **125** is a male USB and female connector **135** is a female

USB, the male USB may be inserted into (e.g., and connected to) the female USB. When male connector **125** is inserted into female connector **135**, battery **145** may be connected to transmitter **140**, as indicated by reference number **150** in FIG. **1**E. Once connected, battery **145** may provide energy to transmitter **140**. When transmitter **140** receives the energy from battery **145**, transmitter **140** may generate a signal (e.g., a Bluetooth low energy signal). For example, as further shown in FIG. **1**E, and by reference number **155**, transmitter **140** may generate a signal indicating that the child safety seat is secured.

As shown in FIG. **1**F, when the belt buckle with belt buckle sleeve **120** is connected to the belt buckle connector with belt buckle connector sleeve **130**, male connector **125** may align with female connector **135** and may be connected to female connector **135**, as described above. In the example shown in FIG. **1**F, the belt buckle may be inserted into the belt buckle connector at a bottom end of the belt buckle connector, to secure the child safety seat, rather than into a top end of the belt buckle connector as described above. As further shown in FIG. **1**F, belt buckle sleeve **120** may include male connector **125** on the front side of belt buckle sleeve **120**, and belt buckle connector sleeve **130** may include female connector **135** on the front side of belt buckle connector sleeve **130**. Additionally, belt buckle sleeve **120** may include the opening (e.g., for the mechanism for disconnecting the belt buckle) on the front side of belt buckle sleeve **120**, and belt buckle connector sleeve **130** may include the opening (e.g., for the mechanism for disconnecting the belt buckle) on the front side of belt buckle connector sleeve **120**.

As shown in FIG. **1**G, belt buckle sleeve **120** may include a sleeve body **160** and male connector **125** may connect to sleeve body **160**. In some implementations, male connector **125** may attach to sleeve body **160** via an adhesive material (e.g., glue, tape, thermoplastic, and/or the like), a fastener (e.g., a screw, a bolt, and/or the like), and/or the like. Alternatively, male connector **125** may be integrally formed with sleeve body **160**. In some implementations, sleeve body **160** may be omitted, and male connector **125** may attach directly to the belt buckle via an adhesive material. Alternatively, male connector **125** may be integrally formed with the belt buckle.

As further shown in FIG. **1**G, belt buckle connector sleeve **130** may include a sleeve body **165** and female connector **135** may connect to sleeve body **165**. In some implementations, female connector **135** may attach to sleeve body **165** via an adhesive material, a fastener, and/or the like. Alternatively, female connector **135** may be integrally formed with sleeve body **165**. In some implementations, sleeve body **165** may be omitted, and female connector **135** may attach directly to the belt buckle connector via an adhesive material. Alternatively, female connector **135** may be integrally formed with the belt buckle connector.

As shown in FIG. **1**H, and by reference number **170**, detection system **115** may generate a signal indicating that a child is secured and present in the child safety seat. For example, transmitter **140** may generate a signal, indicating that the child safety seat is secured, when the belt buckle is connected to the belt buckle connector (e.g., when male connector **125** is connected to female connector **135**. Connecting male connector **125** to female connector **135**, may cause battery **145** to provide energy to transmitter **140**, which may cause transmitter **140** to generate the signal. User device **105** may be configured to receive the signal generated by transmitter **140**. For example, user device **105** may include a Bluetooth low energy beacon receiver and may include software installed that manages the Bluetooth low energy beacon receiver, interprets Bluetooth low energy beacon signals, and/or the like.

Upon receiving the signal, and as shown in FIG. **1**H, user device **105** may determine whether vehicle **110** is moving or is parked. For example, user device **105** may continually (e.g., every one second, every five seconds, and/or the like) communicate with a system of vehicle **110** (e.g., a tracking system, a navigation system, and/or the like) or with a sensor of detection system **115** to determine whether vehicle **110** is moving or stationary, is on a road or off of a road, and/or the like. User device **105** may determine whether the signal is still being received, and may generate an alert when vehicle **110** is parked and the signal is not received. User device **105** may display the alert to the caregiver in order to warn the caregiver that the child is still in vehicle **110**.

In some implementations, the signal may be received by user device **105** for a particular distance that is based on a strength the signal (e.g., a range of transmitter **140**). For example, the particular distance may be five meters, ten meters, twenty meters, and/or the like. Thus, user device **105** may generate the alert when user device **105** travels beyond the range of transmitter **140**. Additionally, or alternatively, user device **105** may determine a distance between transmitter **140** and user device **105** (e.g., based on the strength of the signal, based on global positioning system (GPS) coordinates of user device **105** relative to GPS coordinates of vehicle **110** or detection system **115**, and/or the like). In this case, user device **105** may generate the alert when user device **105** travels beyond a threshold distance.

In some implementations, if the caretaker does not confirm receipt of the alert within a threshold period of time (e.g., thirty seconds, forty seconds, one minute, and/or the like), further action may be taken. For example, detection system **115** may automatically contact other systems or people (e.g., an emergency response system, emergency response personnel, a primary contact of the caregiver, a secondary content of the caregiver, and/or the like), and may provide the system or the people with a location of the child (e.g., the location of vehicle **110**, the location of the child safety seat, and/or the like). In some implementations, detection system **115** may provide additional information to user device **105**, the system, or the people, such as a temperature inside vehicle **110** (e.g., generated by a temperature sensor), a heartrate of the child (e.g., generated by a heartrate sensor), audio data (e.g., generated by a microphone), and/or the like. In some implementations, the alerts provided by user device **105** may increase (e.g., become more frequent, increase in volume, increase in vibration, and/or the like) over time or as user device **105** moves away from detection system **115**, may overrise any muting or volume setting of user device **105**, and/or the like.

As shown in FIG. **1**I, and by reference number **175**, detection system **115** may generate a signal indicating that battery **145** is running low when battery **145** has become depleted below an energy level threshold. For example, detection system **115** may monitor a remaining energy level of battery **145** and may generate the signal, indicating that the battery is running low, when the energy level fails to satisfy the energy level threshold. Upon receiving the signal indicating that the battery is running low, user device **105** may display a user interface recommending that the caregiver replace the battery. Additionally, or alternatively, user device **105** may play a sound, may vibrate, and/or the like upon receiving the signal. In some implementations, user device **105** may continue to provide a message, a sound, a vibration, and/or the like periodically (e.g., every day, every

week, and/or the like) until battery **145** is replaced. In some implementations, user device **105** may increase the frequency of messages, sounds, vibrations, and/or the like, when battery energy is further reduced (e.g., fails to satisfy a second energy level threshold that is lower than a first energy level threshold).

In this way, several different stages of the process for detecting and preventing leaving of an unattended child in a child safety seat of a vehicle are automated, which may remove human subjectivity and waste from the process, and which may improve speed and efficiency of the process and conserve computing resources (e.g., processing resources, memory resources, communication resources, and/or the like), networking resources, and/or the like. Furthermore, implementations described herein use a rigorous, computerized process to perform tasks or roles that were not previously performed or were previously performed using subjective human intuition or input. For example, currently there does not exist a detection system that may be utilized with various child safety seats, and that detects and prevents unattended children in the various child safety seats. Finally, the process for detecting and preventing an unattended child in a child safety seat of a vehicle conserves computing resources, networking resources, and/or the like that would otherwise be wasted in responding to injured children left in child safety seats of vehicles, investigating caregivers responsible for the injured children, caring for the injured children, and/or the like.

As indicated above, FIGS. **1A-1**I are provided merely as examples. Other examples may differ from what was described with regard to FIGS. **1A-1**I. The number and arrangement of devices and networks shown in FIGS. **1A-1**I are provided as an example. In practice, there may be additional devices and/or networks, fewer devices and/or networks, different devices and/or networks, or differently arranged devices and/or networks than those shown in FIGS. **1A-1**I. Furthermore, two or more devices shown in FIGS. **1A-1**I may be implemented within a single device, or a single device shown in FIGS. **1A-1**I may be implemented as multiple, distributed devices. Additionally, or alternatively, a set of devices (e.g., one or more devices) of FIGS. **1A-1**I may perform one or more functions described as being performed by another set of devices of FIGS. **1A-1**I.

FIG. **2** is a diagram of an example environment **200** in which systems and/or methods described herein may be implemented. As shown in FIG. **2**, environment **200** may include user device **105**, detection system **115**, and a network **210**. Devices of environment **200** may interconnect via wired connections, wireless connections, or a combination of wired and wireless connections.

User device **105** includes one or more devices capable of receiving, generating, storing, processing, and/or providing information, such as information described herein. For example, user device **105** may include a mobile phone (e.g., a smart phone, a radiotelephone, etc.), a laptop computer, a tablet computer, a desktop computer, a handheld computer, a gaming device, a wearable communication device (e.g., a smart watch, a pair of smart glasses, a heart rate monitor, a fitness tracker, smart clothing, smart jewelry, a head mounted display, etc.), or a similar type of device. In some implementations, user device **105** may receive information from and/or transmit information to detection system **115**.

Detection system **115** includes one or more devices that detects and prevents an unattended child in a child safety seat of a vehicle. In some implementations, detection system **115** may be designed to fit with various types of child safety seat configurations provided in various types of vehicles, as described above. In some implementations, detection system **115** may receive information from and/or transmit information to one or more user devices **105**.

Network **210** includes one or more wired and/or wireless networks. For example, network **210** may include a cellular network (e.g., a fifth generation (5G) network, a long-term evolution (LTE) network, a third generation (3G) network, a code division multiple access (CDMA) network, etc.), a public land mobile network (PLMN), a local area network (LAN), a wide area network (WAN), a metropolitan area network (MAN), a telephone network (e.g., the Public Switched Telephone Network (PSTN)), a private network, an ad hoc network, an intranet, the Internet, a fiber optic-based network, and/or the like, and/or a combination of these or other types of networks.

The number and arrangement of devices and networks shown in FIG. **2** are provided as an example. In practice, there may be additional devices and/or networks, fewer devices and/or networks, different devices and/or networks, or differently arranged devices and/or networks than those shown in FIG. **2**. Furthermore, two or more devices shown in FIG. **2** may be implemented within a single device, or a single device shown in FIG. **2** may be implemented as multiple, distributed devices. Additionally, or alternatively, a set of devices (e.g., one or more devices) of environment **200** may perform one or more functions described as being performed by another set of devices of environment **200**.

FIG. **3** is a diagram of example components of a device **300**. Device **300** may correspond to user device **105** and/or detection system **115**. In some implementations, user device **105** and/or detection system **115** may include one or more devices **300** and/or one or more components of device **300**. As shown in FIG. **3**, device **300** may include a bus **310**, a processor **320**, a memory **330**, a storage component **340**, an input component **350**, an output component **360**, and a communication interface **370**.

Bus **310** includes a component that permits communication among the components of device **300**. Processor **320** is implemented in hardware, firmware, or a combination of hardware and software. Processor **320** is a central processing unit (CPU), a graphics processing unit (GPU), an accelerated processing unit (APU), a microprocessor, a microcontroller, a digital signal processor (DSP), a field-programmable gate array (FPGA), an application-specific integrated circuit (ASIC), or another type of processing component. In some implementations, processor **320** includes one or more processors capable of being programmed to perform a function. Memory **330** includes a random-access memory (RAM), a read only memory (ROM), and/or another type of dynamic or static storage device (e.g., a flash memory, a magnetic memory, and/or an optical memory) that stores information and/or instructions for use by processor **320**.

Storage component **340** stores information and/or software related to the operation and use of device **300**. For example, storage component **340** may include a hard disk (e.g., a magnetic disk, an optical disk, a magneto-optic disk, and/or a solid-state disk), a compact disc (CD), a digital versatile disc (DVD), a floppy disk, a cartridge, a magnetic tape, and/or another type of non-transitory computer-readable medium, along with a corresponding drive.

Input component **350** includes a component that permits device **300** to receive information, such as via user input (e.g., a touch screen display, a keyboard, a keypad, a mouse, a button, a switch, and/or a microphone). Additionally, or alternatively, input component **350** may include a sensor for sensing information (e.g., a global positioning system (GPS) component, an accelerometer, a gyroscope, and/or an actua-

tor). Output component **360** includes a component that provides output information from device **300** (e.g., a display, a speaker, and/or one or more light-emitting diodes (LEDs)).

Communication interface **370** includes a transceiver-like component (e.g., a transceiver and/or a separate receiver and transmitter) that enables device **300** to communicate with other devices, such as via a wired connection, a wireless connection, or a combination of wired and wireless connections. Communication interface **370** may permit device **300** to receive information from another device and/or provide information to another device. For example, communication interface **370** may include an Ethernet interface, an optical interface, a coaxial interface, an infrared interface, a radio frequency (RF) interface, a universal serial bus (USB) interface, a Wi-Fi interface, a cellular network interface, and/or the like.

Device **300** may perform one or more processes described herein. Device **300** may perform these processes based on processor **320** executing software instructions stored by a non-transitory computer-readable medium, such as memory **330** and/or storage component **340**. A computer-readable medium is defined herein as a non-transitory memory device. A memory device includes memory space within a single physical storage device or memory space spread across multiple physical storage devices.

Software instructions may be read into memory **330** and/or storage component **340** from another computer-readable medium or from another device via communication interface **370**. When executed, software instructions stored in memory **330** and/or storage component **340** may cause processor **320** to perform one or more processes described herein. Additionally, or alternatively, hardwired circuitry may be used in place of or in combination with software instructions to perform one or more processes described herein. Thus, implementations described herein are not limited to any specific combination of hardware circuitry and software.

The number and arrangement of components shown in FIG. **3** are provided as an example. In practice, device **300** may include additional components, fewer components, different components, or differently arranged components than those shown in FIG. **3**. Additionally, or alternatively, a set of components (e.g., one or more components) of device **300** may perform one or more functions described as being performed by another set of components of device **300**.

FIG. **4** is a flow chart of an example process **400** for detecting and preventing an unattended child in a child safety seat of a vehicle. In some implementations, one or more process blocks of FIG. **4** may be performed by a system (e.g., detection system **115**). In some implementations, one or more process blocks of FIG. **4** may be performed by another device or a group of devices separate from or including the system, such as a user device (e.g., user device **105**).

As shown in FIG. **4**, process **400** may include interconnecting a buckle and a buckle connector of a child safety seat (block **410**). For example, a user of the system may interconnect a buckle and a buckle connector of a child safety seat, as described above.

As further shown in FIG. **4**, process **400** may include interconnecting a male connector, attached to the buckle, and a female connector attached to the buckle connector (block **420**). For example, a user of the system may interconnect a male connector, attached to the buckle, and a female connector attached to the buckle connector, as described above.

As further shown in FIG. **4**, process **400** may include electrically coupling a battery, connected to the female connector, and a transmitter, connected to the male connector, based on interconnecting the male connector and the female connector (block **430**). For example, the system (e.g., using processor **320**, memory **330**, communication interface **370**, and/or the like) may electrically couple a battery, connected to the female connector, and a transmitter, connected to the male connector, based on interconnecting the male connector and the female connector, as described above.

As further shown in FIG. **4**, process **400** may include providing energy from the battery to the transmitter based on electrically coupling the battery and the transmitter (block **440**). For example, the system (e.g., using processor **320**, output component **360**, communication interface **370**, and/or the like) may provide energy from the battery to the transmitter based on electrically coupling the battery and the transmitter, as described above.

As further shown in FIG. **4**, process **400** may include generating a signal, indicating that a child is present in the child safety seat, with the transmitter based on providing energy from the battery to the transmitter (block **450**). For example, the system (e.g., using processor **320**, memory **330**, storage component **340**, communication interface **370**, and/or the like) may generate a signal, indicating that a child is present in the child safety seat, with the transmitter based on providing energy from the battery to the transmitter, as described above.

Although FIG. **4** shows example blocks of process **400**, in some implementations, process **400** may include additional blocks, fewer blocks, different blocks, or differently arranged blocks than those depicted in FIG. **4**. Additionally, or alternatively, two or more of the blocks of process **400** may be performed in parallel.

The foregoing disclosure provides illustration and description, but is not intended to be exhaustive or to limit the implementations to the precise form disclosed. Modifications and variations may be made in light of the above disclosure or may be acquired from practice of the implementations.

As used herein, the term "component" is intended to be broadly construed as hardware, firmware, or a combination of hardware and software.

Some implementations are described herein in connection with thresholds. As used herein, satisfying a threshold may, depending on the context, refer to a value being greater than the threshold, more than the threshold, higher than the threshold, greater than or equal to the threshold, less than the threshold, fewer than the threshold, lower than the threshold, less than or equal to the threshold, equal to the threshold, etc., depending on the context.

Certain user interfaces have been described herein and/or shown in the figures. A user interface may include a graphical user interface, a non-graphical user interface, a text-based user interface, and/or the like. A user interface may provide information for display. In some implementations, a user may interact with the information, such as by providing input via an input component of a device that provides the user interface for display. In some implementations, a user interface may be configurable by a device and/or a user (e.g., a user may change the size of the user interface, information provided via the user interface, a position of information provided via the user interface, etc.). Additionally, or alternatively, a user interface may be pre-configured to a standard configuration, a specific configuration based on a type of device on which the user interface is displayed, and/or a set

of configurations based on capabilities and/or specifications associated with a device on which the user interface is displayed.

It will be apparent that systems and/or methods described herein may be implemented in different forms of hardware, firmware, or a combination of hardware and software. The actual specialized control hardware or software code used to implement these systems and/or methods is not limiting of the implementations. Thus, the operation and behavior of the systems and/or methods were described herein without reference to specific software code—it being understood that software and hardware may be designed to implement the systems and/or methods based on the description herein.

Even though particular combinations of features are recited in the claims and/or disclosed in the specification, these combinations are not intended to limit the disclosure of various implementations. In fact, many of these features may be combined in ways not specifically recited in the claims and/or disclosed in the specification. Although each dependent claim listed below may directly depend on only one claim, the disclosure of various implementations includes each dependent claim in combination with every other claim in the claim set.

No element, act, or instruction used herein should be construed as critical or essential unless explicitly described as such. Also, as used herein, the articles "a" and "an" are intended to include one or more items, and may be used interchangeably with "one or more." Further, as used herein, the article "the" is intended to include one or more items referenced in connection with the article "the" and may be used interchangeably with "the one or more." Furthermore, as used herein, the term "set" is intended to include one or more items (e.g., related items, unrelated items, a combination of related and unrelated items, etc.), and may be used interchangeably with "one or more." Where only one item is intended, the phrase "only one" or similar language is used. Also, as used herein, the terms "has," "have," "having," or the like are intended to be open-ended terms. Further, the phrase "based on" is intended to mean "based, at least in part, on" unless explicitly stated otherwise. Also, as used herein, the term "or" is intended to be inclusive when used in a series and may be used interchangeably with "and/or," unless explicitly stated otherwise (e.g., if used in combination with "either" or "only one of").

What is claimed is:

1. A detection system, comprising:

a first sleeve shaped to receive and retain a buckle of a child safety seat,

wherein the first sleeve includes:

a first body portion shaped to receive and retain the buckle of the child safety seat,

a male connector portion integrally formed with the first body portion, and

a transmitter electrically coupled to the male connector portion; and

a second sleeve shaped to receive and retain a buckle connector of the child safety seat,

wherein the buckle connector of the child safety seat is configured to receive and connect with the buckle of the child safety seat,

wherein the second sleeve includes:

a second body portion shaped to receive and retain the buckle connector of the child safety seat,

a female connector portion connected to the second body portion, and

a battery electrically coupled to the female connector portion and configured to provide energy to the transmitter when the male connector portion communicates with the female connector portion,

wherein the male connector portion communicates with the female connector portion when the buckle connector connects with the buckle, and

wherein the transmitter is configured to generate a signal that indicates that a child is present in the child safety seat, in response to the transmitter receiving energy from the battery.

2. The detection system of claim **1**, wherein the male connector portion includes a male Universal Serial Bus (USB) connector.

3. The detection system of claim **1**, wherein the female connector portion includes a female Universal Serial Bus (USB) connector.

4. The detection system of claim **1**, wherein the male connector portion includes one or more pins that are sized and shaped to be received by one or more corresponding openings provided in the female connector portion.

5. The detection system of claim **1**, wherein the first sleeve and the second sleeve comprise an elastomeric material.

6. The detection system of claim **1**, wherein a size and a shape of the first sleeve substantially matches a size and shape of the buckle of the child safety seat so that an inner surface of the first sleeve frictionally engages an outer surface of the buckle of the child safety seat.

7. The detection system of claim **1**, wherein a size and a shape of the second sleeve substantially matches a size and shape of the buckle connector of the child safety seat so that an inner surface of the second sleeve frictionally engages an outer surface of the buckle connector of the child safety seat.

8. The detection system of claim **1**, wherein the transmitter includes a Bluetooth low energy beacon.

9. The detection system of claim **1**, wherein the first sleeve further comprises one or more of:

a temperature sensor,

a heartrate sensor, or

a microphone.

10. The detection system of claim **1**, wherein the female connector portion is connected to the second body portion via an adhesive material or is integrally formed with the second body portion.

11. The detection system of claim **1**, wherein the transmitter is configured to generate a low battery signal when the battery becomes depleted.

12. The detection system of claim **1**, wherein the transmitter provides the signal to a user device when the user device is within a predetermined distance from the transmitter.

13. A child safety seat, comprising:

a buckle;

a buckle connector,

wherein the buckle connector is configured to receive and connect with the buckle;

a male connector attached to the buckle;

a transmitter electrically coupled to the male connector;

a female connector attached to the buckle connector; and

a battery electrically coupled to the female connector and configured to provide energy to the transmitter when the male connector communicates with the female connector,

wherein the male connector communicates with the female connector when the buckle connector connects with the buckle, and

wherein the transmitter is configured to generate a signal, indicating that a child is present in the child safety seat, when the transmitter receives energy from the battery.

14. The child safety seat of claim **13**, wherein the male connector includes a male Universal Serial Bus (USB) connector, and

wherein the female connector includes a female USB connector.

15. The child safety seat of claim **13**, wherein the male connector includes one or more pins that are sized and shaped to be received by one or more corresponding openings provided in the female connector.

16. The child safety seat of claim **13**, wherein the transmitter includes a Bluetooth low energy beacon.

17. The child safety seat of claim **13**, wherein the transmitter provides the signal to a user device when the user device is within a predetermined distance from the transmitter.

18. The child safety seat of claim **13**, wherein the male connector is attached to the buckle via an adhesive material or is integrally formed with the buckle.

19. The child safety seat of claim **13**, wherein the female connector is attached to the buckle connector via an adhesive material or is integrally formed with the buckle connector.

20. A detection system, comprising:

a female connector attached to a buckle connector of a child safety seat,

a transmitter electrically coupled to the female connector;

a male connector attached to a buckle of the child safety seat,

wherein the buckle connector of the child safety seat is configured to receive and connect with the buckle of the child safety seat;

a battery electrically coupled to the male connector and configured to provide energy to the transmitter when the female connector communicates with the male connector,

wherein the female connector communicates with the male connector when the buckle connector connects with the buckle, and

wherein the transmitter is configured to generate a signal, indicating that a child is present in the child safety seat, when the transmitter receives energy from the battery.

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